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EU 2050 long-term strategy

Addition to the appreciation document: *Annex D*

Prepared for:

Ministry of Economic Affairs and Climate Policy

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Reference No.: 207796
20-3-2019

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ABBREVIATIONS

BECCS	Bioenergy with Carbon Capture and Storage
CCS	Carbon Capture and Storage
CCU	Carbon Capture and Usage
CH_4	Methane
CO_2	Carbon Dioxide
DACCS	Direct Air Capture and Carbon Sequestration
EC	European Commission
EE	Energy efficiency
EU	European Union
F-gases	Fluorinated gases
GHG	Greenhouse Gas Emissions
H_2	Hydrogen
Mt	Megatons
N_2O	Nitrous Oxide
RED II	Renewable energy directive
TWh	Terawatt hour

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ANNEX D: COMPARISON OF EUROPEAN STRATEGY WITH DUTCH CLIMATE POLICIES

1. Comparison EC 2050 long-term strategy with Dutch climate targets

Target/topic	Dutch Climate Law[1]	Dutch Climate Agreement	EU 2050 long-term study
GHG reduction 2050 compared to 1990	-95%, herewith committing to the Paris Agreement, regarding maximum 2 °C temperature rise by 2100		-100% (net zero emissions), in line with 1.5 °C temperature rise
GHG reduction 2030 compared to 1990	-49% (to be reviewed depending on EU target)	-49% (to be reviewed depending on EU target)	No target, current policies on energy efficiency and renewable energy would result in -46% (p52 in the EC report)
Power sector target 2050	100% CO_2-neutral electricity production		80% renewable, 15% nuclear, the rest e-liquids/e-gas and some natural gas boilers with CCS (not a target, but a scenario)

[1] Sources used:

- "Voorstel van klimaatwet, nr 2" en "Voorstel Klimaatwet – Memorie van toelichting, nr 3", 34534, Voorstel van wet van de leden Klaver en Samsom houdende een kader voor het ontwikkelen van beleid gericht op onomkeerbaar en stapsgewijs terugdringen van de Nederlandse emissies van broeikasgassen teneinde wereldwijde opwarming van de aarde en de verandering van het klimaat te beperken (Klimaatwet), Vergaderjaar 2015-2016, Tweede Kamer der Staten-Generaal.
- "Nota van wijziging", 34534, Voorstel van wet van de leden Klaver, Asscher, Beckerman, Jetten, Dik-Faber, Yesilgöz-Zegerius en Agnes Mulder houdende een kader voor het ontwikkelen van beleid gericht op onomkeerbaar en stapsgewijs terugdringen van de Nederlandse emissies van broeikasgassen teneinde wereldwijde opwarming van de aarde en de verandering van het klimaat te beperken (Klimaatwet), vergaderjaar 2017-2018, Tweede Kamer der Staten-Generaal
- Ontwerp van het Klimaatakkoord, 21 december 2018 (Dutch Climate Agreement), Ed Nijpels, voorzitter Klimaatberaad

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2. Summary of sectoral priorities: EU 2050 long-term strategy and Dutch Climate Agreement

2.1. Power sector

Dutch Climate Agreement	EU 2050 long-term study
• To reach 49% reduction in 2030, it is needed to produce 84 TWh from renewable sources in 2030 (49 TWh wind offshore and 35 TWh renewable on land) • The power system must become more flexible, use demand response and become more interconnected with neighbouring countries to deal with the intermittent output of power sources like solar and wind • The energy system needs to have sufficient capacity to timely meet the needs of demand and supply • There is a growing role for hydrogen, as a carbon-free feedstock for the process industry, for high-temperature heat, storage, mobility and buildings. Electrolysers are needed.	• Reduction of the energy demand and an overall increase in energy efficiency • Large-scale deployment of zero-carbon energy sources from renewables (mainly solar) and nuclear used for power generation (electricity and fuel) or heating • Carbon capture and sequestration/utilisation technology application to capture remaining CO_2 emissions from fossil fuel combustion • Maximising the use of electricity and thermal storage solutions • Integration of new carbon-free energy carriers, such as hydrogen (H_2), e-gas (e-CH_4) and e-liquids • Sector coupling of the energy, transport and industrial network infrastructure

2.2. Buildings

Dutch Climate Agreement	EU 2050 long-term study
• Acceleration renovation existing stock (200,000 houses/year in 2030) • 2030 goal: 3.4 Mt CO_2 emission reduction compared to the reference scenario (NEV 2017) • 2030 goal: 1.5 million houses renovated, and 1 Mt CO_2 emissions reduced in service buildings • Reducing heating with natural gas • Expectation: 50% heat through district heating, 25% hybrid heat pumps and 25% full electric heat pumps	• Buildings are renovated at a rate of 1.7-1.8% per year in the residential sector and 1.5-1.6% in the services sector • Reducing heat demand through improved materials for thermal insulation • Efficient equipment • Switching to zero-carbon energy carriers (renewable electricity, solar thermal hydrogen, e-gas and or/biogas mixture) • Significant electrification and reduction of fuel use, natural gas fully phased out in 2050

Dutch Climate Agreement	EU 2050 long-term study
• More sustainable heat (waste heat, green gas, geothermal, etc.) • Zero carbon buildings in 2050	• All new buildings build from 2021 onwards to be nearly zero-energy buildings in terms of energy consumption • Digitalisation • Behavioural change • Circular economy

2.3. Industry

Dutch Climate Agreement	EU 2050 long-term study
• 14.3 Mt additional CO_2 reduction compared to reference scenario • 6 Mt CO_2 emission reduction should come from process efficiency • 2 Mt emission reduction should come from reduction of F-gases and N_2O *(note: in the EC study this is not part of industry but of non-CO_2 emissions)* • 4 Mt CO_2 reduction should come from electrification (power to heat) and green hydrogen • 1 Mt CO_2 reduction should come from recycling, CCU and bio-based chemicals • 7 Mt CO_2 reduction should come from CCS • Dutch companies should be among the 10% most energy efficient in Europe in 2030 in their sector	• Strong focus on energy efficiency, also through more circularity • Reducing material losses in energy-intensive sectors (plastic, aluminium, steel, aluminium and cement industry) have the potential to reduce emissions up to 40% -56% per year until 2050 • Material substitution • Electrification and fuel switching (much more hydrogen and e-gases, steep decline in use of natural gas) • Carbon capture and sequestration and or use (CCS and CCU) for processes that cannot be reduced otherwise • Innovative processes • Industrial symbiosis

2.4. Transport

Dutch Climate Agreement	EU 2050 long-term study
• Intermediate target to reduce emissions with 7.3 Mt in 2030	• Carbon free transport through electrification, biofuels and e-fuels, EE, modal shift • Heavy investments in low- and zero emission vehicle technology with carbon neutral fuels

Dutch Climate Agreement	EU 2050 long-term study
• Modal shift, less vehicle ownership, more public transport and cycling, multi-modal hubs • 8 billion km less personal car usage (saving 1 Mt CO_2) • Sustainable biofuels for shipping and aviation (following RED II directive) • 30% less CO_2 emissions in hinterland and continental transport in 2030 • 100% zero carbon new build personal cars by 2030, based on renewable energy carriers, e-fuels, hydrogen and electrification • 300,000 fuel cell vehicles for people transport in 2030 • Sustainable logistics, carbon neutral and circular infrastructure works • Sustainable procurement Dutch government (CO_2 Performance Ladder etc.) • At least 1,000 employers reduce business travel emissions with 50% in 2030	• Improved infrastructure (like electric charging infrastructure) • Increased efficiency • Influencing behaviour • Steep reduction in energy consumption in road transport, relative reduction of air travel demand compared to the baseline • Electricity will be the most prominent source of energy especially in the road transport • Liquid biofuels consumption will increase in road, air and inland navigation. Liquid biofuels and e-fuels and hydrogen will be important for the maritime and inland transport. Advanced biofuels and e-fuels will substitute remaining jet fuels. For heavy duty road transport mainly electricity and hydrogen are key.

2.5. Agriculture and land use (Dutch Climate Agreement) versus non- CO_2 emissions, land resources and negative emissions (EU 2050 long-term study study)

Dutch Climate Agreement	EU 2050 long-term study
• Target to reduce 3.5 Mt CO_2 emissions in 2030 (additional to reference scenario) • 1 Mt CO_2 to be reduced in cattle farming (methane emission reduction through different treatment of manure, different feed for cattle, etc.) in 2030	• Reduction in agriculture by increasing productivity, adopting innovative technologies like precision farming and zero tillage, leading to less nitrous oxide and methane • Preserve carbon from agricultural soil • Maintain forests as a carbon sink

Dutch Climate Agreement	EU 2050 long-term study
• 1.5 Mt CO_2 to be reduced through improved land use in 2030 • 1 Mt CO_2 to be reduced in greenhouses (sustainable heat/geothermal, electrification, using captured CO_2) in 2030 • Zero emissions from energy consumption in 2030 and production of renewable electricity • Natural carbon sinks through avoiding deforestation, more carbon sequestration, afforestation and CCU, soil management • Shifting of diet demands to reduce animal product consumption	• Use land to cultivate biomass to substitute fossil-based equivalents • Reduction in energy sector by reducing emissions from fuel combustion, fossil fuel extraction, and fugitive emissions from transmissions and distribution with technological mitigation and decreased fuel consumption • Reduction in waste sector by mainly mitigating methane emissions with policy or existing technologies • Reduction in refrigerant and air conditioning sectors by technological mitigation • Shifting of diet demands to reduce animal product consumption • BECCS and DACCS to remove emissions from the atmosphere